Space Weather Technical Forecast

Issued on Thursday, 07 March 2024 at 00:44 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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The planned NOAA SWPC data outage on 6th March between 1600 UTC and 2200 UTC has been postponed until further notice. This was due to impact most of our observational data feeds and some models. https://www.swpc.noaa.gov/news/postponement-planned-network-outage.

Space Weather Forecast Headline: Chance of G1/Minor Storms on day 2 (08 Mar) given likely HSS arrival.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Low solar activity throughout. There are seven sunspot regions on the visible disc, with AR3595 rotated off the western limb and AR3596 increasingly fading. AR3599 continues to be the most magnetically complex, with continued slight development with the trailing portion. The remaining regions are small and generally stable.

Modelling is currently ongoing for a filament lift off in the southeast disk on the 05 Mar, this is largely expected to pass below Earth's orbit but may give a glancing blow later on day 2 (08 Mar).

Solar Wind / Geomagnetic Activity: Solar wind parameters observed primarily by ACE at L1 were originally slightly elevated at around 400-450km/s, before falling largely to slow-ambient levels 360-390 km/s around 06/1200UTC. Density has been mostly below average. Total magnetic field strength has been weak throughout +2/+8nT. The north-south component has varied weakly throughout between +6nT and -6nT. Phi angle has been primarily negative (away from the Sun) but with brief positive intervals. Geomagnetic activity was mostly quiet (Kp0-2) with a brief interlude of unsettled (Kp3).

Energetic Particles / Solar Radiation: GOES18 high energy (greater than 10MeV) proton flux was at background levels. High energy electron flux (greater than 2MeV) observed at GOES16 was predominantly at background levels with the associated 24 hour fluence well below the Active (1e8 integrated pfu) threshold. The observed 24-hour fluence was level at 06/0000UTC was 1.23e6 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Expected to remain generally low with a slight chance of an isolated M-class flare.

Solar Wind / Geomagnetic Activity: A CME was observed to depart the southwest of the Sun on the 03 Mar and may glance the Earth with impacts possible early on day 1 (07 Mar), although this is low confidence. A filament lift-off to the southeast of the sun on the 05 march may give a glancing blow later on day 2 (08 Mar), but modelling is ongoing. A negative polarity coronal hole currently near centre disc is then forecast to connect with Earth into day 2 (08 Mar) and persist into day 3 (09 Mar) with solar winds perhaps reaching elevated levels. Generally Quiet to Unsettled geomagnetic activity is forecast to continue during day 1 (07 Mar), with a chance of Active intervals and a slight chance of a G1/Minor Storm given the potential for glancing CME influence. Into day 2 (08 Mar) generally Unsettled conditions expected with Active intervals likely and a chance of G1/Minor Storm intervals in association with the arrival of the HSS and the risk

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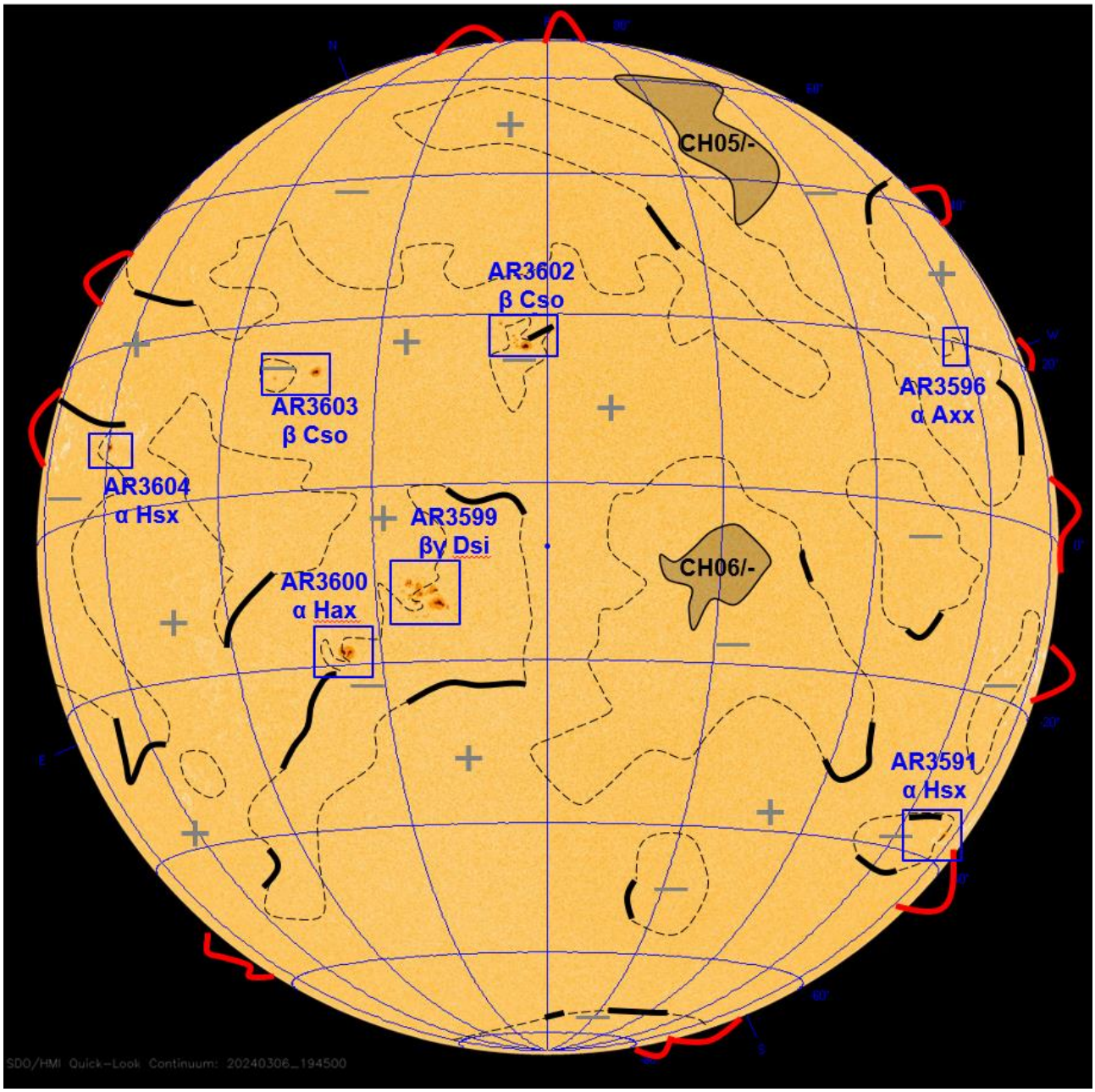
for further glancing CME influence, these conditions may continue into day 2 (09 Mar) before conditions likely ease into day 4 (10 Mar).

Energetic Particles / Solar Radiation: GOES18 high energy proton flux is expected to persist at background levels. GOES16 high energy electron flux is expected to remain at mainly background levels, with the associated 24hr fluence remaining well below the Active threshold.

Figure 1. Solar Analysis Valid 06/1945UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Met Office Space Weather Technical Forecast

Geomagnetic Storms:

A CME, originating near AR3591, was observed to depart the southwest of the Sun on the 03 Mar and there is a slight chance this may glance the Earth with impacts possible early on day 1 (07 Mar), although this is low confidence. Modelling is also ongoing for a filament lift off in the southeast disk on the 05 Mar, the majority of the CME is expected to pass below Earths orbit but there is a chance it may provide a glancing blow later on day 2 (08 Mar), but confidence is currently low.

Otherwise the Earth is in a slow-ambient solar wind environment. The CME from 03 Mar may provided a glancing blow early on day 1 (07 Mar) although this reasonably low confidence. A negative polarity coronal hole currently near centre disc is then forecast to connect with Earth into day 2 (08 Mar) and persist into day 3 (09 Mar) with solar winds perhaps reaching elevated levels although confidence is reduced as this feature was not present on the previous rotation. Geomagnetic activity from this feature could see a greater risk for a strong connection as Earth moves closer to the March equinox.

Generally Quiet to Unsettled geomagnetic activity is forecast to continue during day 1 (07 Mar), with a slight chance of Active intervals and a slight chance of a G1/Minor Storm given the potential for glancing CME influence. Into day 2 (08 Mar) generally Unsettled conditions expected with Active intervals likely and a chance of G1/Minor Storm intervals in association with the arrival of the HSS and perhaps the effects of the glancing CME from the filament lift-off on the 05 March, perhaps continuing into day 3 (09 Mar) before conditions likely ease into day 4 (10 Mar).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	30	30	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
03/1730	Partial	Filament	SW	500km/s	07/0300UTC	Low confidence glancing blow
06/0201	Partial	Filament	SE	800Km/s	08/2100UTC	Low confidence glancing blow

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Radio Blackouts - X-Ray Flares:

Low activity is expected, with a slight chance of isolated Moderate activity maintained throughout. The current most likely source of flare activity, AR3599, remains on the visible disk throughout. Far side soundings do not currently suggest any major oncoming regions expected during the period.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	20	20	20	20
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

GOES-18 proton flux is currently at background levels, and is expected to remain so through the period in the likely absence of significant western hemisphere sunspot activity.

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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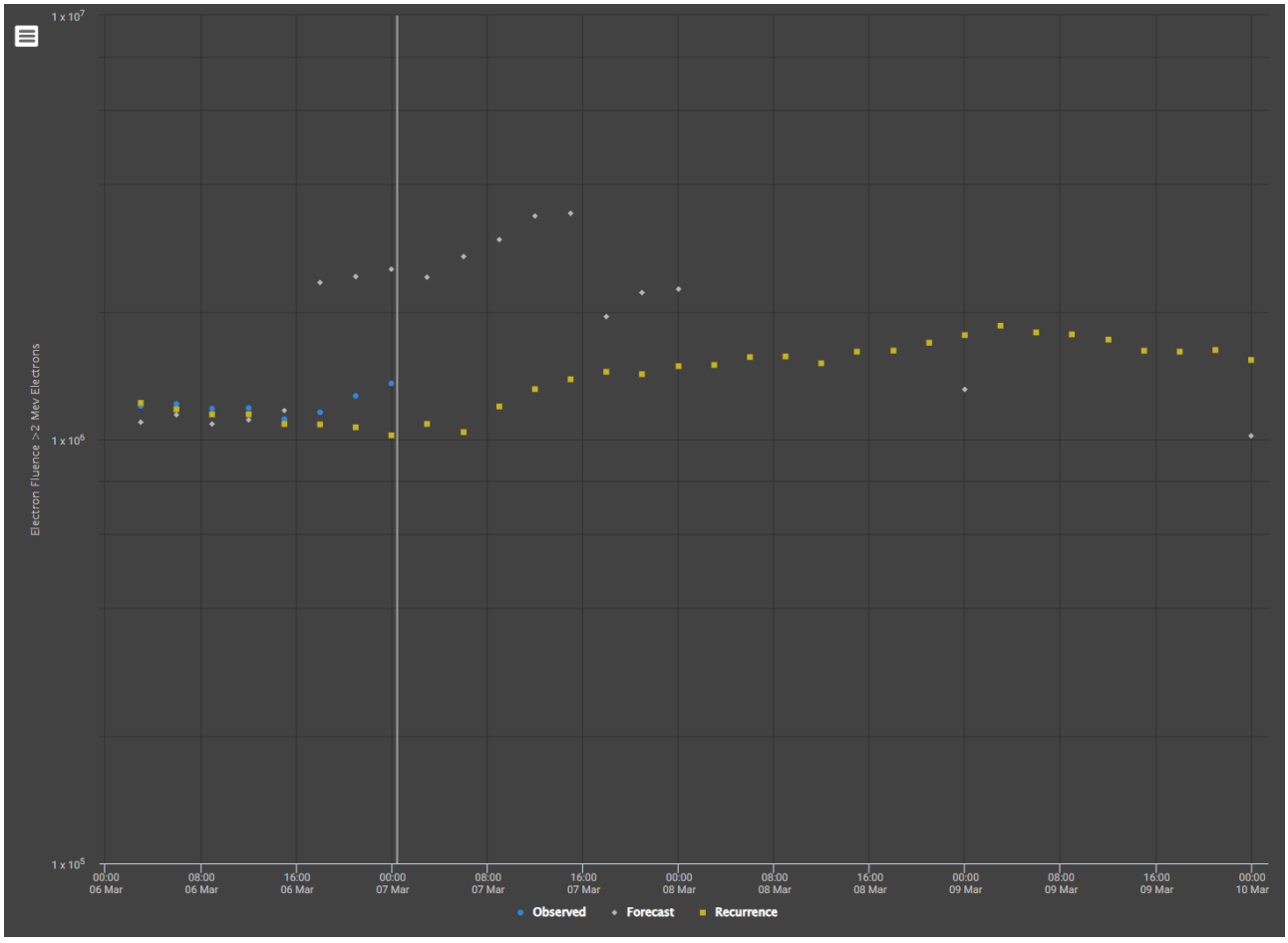
High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2MeV) remains at background levels despite CME influence in recent days and it expected to generally remain so through much of the forecast period. Any enhancement as a result of CME or coronal hole high speed stream influence are likely to be towards the end of this four-day guidance period.

Consequently, the electron fluence is expected to remain well below the Active threshold with MOSWOC REFM model output viewed as providing reasonable guidance.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	5	5
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 2: Latest MOSWOC REFM model output



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